MULTIFUNCTION INFORMATION DISTRIBUTION SYSTEM LOW VOLUME TERMINAL (MIDS-LVT)

Joint ACAT ID Program (Navy Lead)

Total Number of Systems:	2,040
Total Program Cost (TY$):	$2,270.7M
Average Unit Cost (TY$):	$239K
Low Rate Initial Production:	3QFY00
Full-rate production:	3QFY01
OT-IIA-3 Operational Assessment *(F/A-18 MIDS):*	2QFY00
OT-IIB-2 Operational Evaluation *(MIDS on Ships):*	2QFY01
OT-IIA-6/7 Operational Evaluation *(F/A-18 MIDS):*	2QFY03

Prime Contractor

Terminal Design: MIDSCO
Production: ViaSat Data Link Solutions

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020

The Multifunctional Information Distribution System-Low Volume Terminal 1 (MIDS-LVT 1) provides Link 16 digital data communications to host fighter, surface combatant, airborne laser, reconnaissance, and Command and Control (C2) host systems, providing a ***common relevant operational picture*** of theater air and surface activity. Link 16 provides a jam-resistant network for **Joint and Multinational Force** data sharing. The early warning and air track identification information provided by Joint sensor and C2 platforms supports the coordination of long-range ***precision engagement*** fires, safe passage zones, and near real-time warnings of impending attack—contributing to f***ull-dimensional protection***. The surveillance and weapons coordination engagement options provided by Link 16 enable ***synchronized operations*** and employment of the ***correct weapons*** for each target to generate the desired results. Engagement intentions and results are shared by all network participants, contributing to improved ***decision making*** by the Battle Commanders. The MIDS-LVT 1 terminal shares a number of components with the Army MIDS-LVT 2 and USAF F-15 Fighter Data Link terminals, providing a significantly improved level of ***sustainment interoperability***.

MIDS includes the MIDS-LVT terminal, power supply, and host platform software, antenna, and displays. The MIDS-LVT contains Shop-Replaceable Units (SRUs) that can be replaced or removed depending on host needs. For surface ship applications, the 200-watt MIDS-LVT Power Amplifier is augmented with a 1,000-watt High Power Amplifier. For fighters, the MIDS-LVT contains a Tactical Air Navigation (TACAN) SRU.

Planned MIDS-LVT 1 host platforms include AEGIS destroyers, next-generation aircraft carriers, amphibious ships, F/A-18 fighter aircraft, F-16 fighters, Airborne Laser, and NATO systems.

BACKGROUND INFORMATION

The MIDS-LVT terminal was developed by an international consortium coordinated through MIDSCO. MIDSCO was dissolved in June 2000, and will not participate in the production phase of MIDS-LVT.

In April 2000, the DAB approved the Lot 1 LRIP of MIDS-LVT terminals. The LRIP production vendors are ViaSat and Data Link Solutions. The LRIP terminals will be used for host platform integration, testing, and early fielding. Approval of a second LRIP lot is anticipated in FY01.

The test strategy is based on the evaluation of the MIDS-LVT terminal, as integrated into the host platform; since, by itself, the MIDS terminal provides no combat capability. Experience from test and evaluation of the predecessor Joint Tactical Information Distribution System Class 2 terminals suggests that integration of the terminal into the host is a critical technical challenge. Integration efforts underway include: F/A-18 C/D/E/F variants, F-16C Blocks 40 and 50, Navy Surface Force, Army PATRIOT, and the Airborne Laser program.

TEST & EVALUATION ACTIVITY

MIDS-LVT testing for FY00 included both DT and OT events. The Capstone MIDS-LVT TEMP, the F/A-18 Integration Annex, and the Shipboard Annex supported the testing. The program's TEMP status is as follows:

- The Joint TEMP addressing Link 16 interoperability testing has been approved.
- Updates to the Navy MIDS-LVT TEMP Annex and F/A-18 MIDS TEMP Appendix have been reviewed by DOT&E.
- The TEMP Appendix for MIDS on Ship and a draft F-16 MIDS Integration TEMP Annex were provided for DOT&E review.

The OT-IIA-2 Test Plan, which supported operational testing for F/A-18 integration, was approved by DOT&E.

An exhaustive F/A-18 integration DT consisted of laboratory Hardware-in-the-Loop laboratory testing as well as flight testing phases.

Three EMD MIDS-LVT equipped F/A-18C/D fighters participated in the All Service Combat Identification Evaluation Team (ASCIET) 2000 event. While not a pre-planned DT event, two aircraft flew twice daily conducting Combat Air Patrol (CAP) missions against adversary aircraft. CAP stations

alternated between overwater and overland airspace under the control of various C2 platforms. The F/A-18s flew 43 sorties participating in the ASCIET Joint Service Link 16 network. The network included USAF E-3 AWACS, E-8 JSTARS, and RC-135 Rivet Joint; USMC Tactical Air Operations Center; Army JLENS, PATRIOT and FAAD C2; Navy E-2C, DDG, F-14D, and F/A-18; United Kingdom Tornado FR1 and Frigate as network participants in an operationally stressing environment.

Commander, Operational Test and Evaluation Force (COTF) and VX-9 test pilots conducted one operational test, OT-IIA-2, during ASCIET 2000. Four OA sorties flew profiles identical to the DT events.

The MIDS on Ship program conducted DT-IIB 1 as a laboratory test event employing MIDS on Ship hardware and software interfacing with representative Navy Link 16 host platforms such as the E-2C, F-14D, and other surface ships.

TEST & EVALUATION ASSESSMENT

Results of DT laboratory tests and participation in ASCIET indicated that MIDS-LVT, as currently integrated into the F/A-18, provided a basic level of Link 16 digital data interoperability with Joint and Allied Link 16 capable platforms and contributed to the completion of the F/A-18 mission. Entering the Link 16 network on every flight, the F/A-18s exchanged position, track, and targeting coordination messages among themselves and other network participants. The F/A-18s reported their air tracks to network participants and received command messages from AWACS via Link 16. The aircrew stated that, when working, MIDS provided improved situational awareness of threats and friendly forces, including intentions.

OT-IIA 2 testing conducted during ASCIET identified a number of F/A-18 MIDS-LVT compatibility and training shortfall issues. First, MIDS-LVT integration frequently caused the F/A-18 mission computer to stop processing data. This required an in-flight computer reboot. Second, the terminal suffered numerous Interference Protection Feature (IPF) alerts, indicating possible out-of-band transmissions of Link 16 data. The indication of an IPF to the aircrew was not apparent. The aircrew relied on other network participants to inform them that they were not transmitting. The current IPF alert, located a number of layers beneath the in-flight tactical display, is not visible and therefore does not properly alert the aircrew. It is essential that this alert be moved to the display page most viewed or, by placing an alert in the Heads-Up Display and providing an audible alert. Once the aircrew was alerted, the IPF re-set function proved unreliable. Third, as indicated by performance problems discovered during DT, the MIDS-LVT TACAN still exhibited deficiencies in both air-to-air and air-to-ground modes. Lastly, Digital Link 16 voice communications were attempted; however, MIDS was unable to satisfactorily exchange voice communications.

The COTF OT-IIA 2 evaluation conducted during ASCIET concluded that MIDS-LVT integration in the F/A-18 was potentially not operationally suitable. This evaluation was based on the problems experienced by the aircrew during OA missions and as enumerated above. In addition, the OA indicated that the throttle grip five-position switch modification and the display symbol overloads experienced were not operationally acceptable. Since the scope of the evaluation was limited by the Navy to two areas—compatibility and human factors—the OA did not collect data or comment on the potential operational effectiveness of MIDS-LVT integration into the F/A-18.

The DAB, as exit criteria for the next acquisition phase, LRIP Lot 2, directed that OT-IIA 3 deficiencies be corrected and a satisfactory OT-IIA 3 OA report be submitted.

CONCLUSIONS AND RECOMMENDATIONS

In summary, OT-IIA 2 indicated that integration of MIDS into the F/A-18 is immature. Discrepancies included:

- Mission Computer failures during MIDS operations.
- MIDS Tactical Air Navigation not supporting the operational requirement.
- The aircrew MIDS displays were frequently overloaded (by symbology).
- The aircrew throttle grip provided improper cues to aircrew.
- There were many Interference Protection Feature alerts; these alerts were not readily visible to the aircrew while in flight; and the IPF re-set feature was intermittent.
- F/A-18 MIDS entry into the Link 16 network included unwieldy workarounds and inaccurate information.

The discovery of these discrepancies and their operational impact were brought about by participation in scheduled operational exercises. Leveraging exercises such as ASCIET provides early operational insight into MIDS development and integration. To gain the utmost knowledge however, improvements in collecting and sharing DT data are needed. Additionally, test schedules should provide adequate time between events to analyze test data to improve learning and the product.

The OT-IIA 2/ASCIET event provided the developer, user, and operational tester with the first operationally relevant experience with MIDS-LVT integration into a host platform. While some of the problems discussed above had been observed in laboratory testing, the magnitude and impact were not realized until the system was placed in this robust operational environment. In particular, many of the mission computer failure modes were seen in the lab testing, but the frequency with which they occurred and the impact upon mission was not anticipated.

In order to derive meaningful results from leveraged test events, comprehensive planning must take place between the test organizations. Results of the event may be complicated by the separation of test responsibilities and data collection and analysis among testers. In order to derive maximum benefit from the test, each group must have insight into the overall picture. Sharing of DT data and results among the MIDS developer, F/A-18 platform DT agencies, the user, COTF, and DOT&E must continue to be stressed and every opportunity to improve must be utilized.